# 1.0 INTRODUCTION

## 1.1 Site Location

## 1.2 Site History

## 1.3 Basis for Concern

## 1.4 Operable Units

For large and complex sites such as Libby, it is often convenient, for administrative and practical reasons, to divide the site up into a series of Operable Units that can be investigated and addressed on differing time tracks. For this reason, Libby has been divided into 8 Operable Units (OUs), as follows:

- OU1. The former Export Plant, defined geographically by the property boundary of the parcel that included the former Export Plant.
- OU2. An as yet undefined geographic area surrounding the former Screening Plant. EPA expects to define the geographic extent of this OU in the future based primarily upon the extent of contamination associated with the former Screening Plant.
- OU3. An as yet undefined geographic area surrounding the former vermiculite mine and Rainy Creek Road. EPA expects to define the geographic extent of this OU in the future based primarily upon the extent of contamination associated with the former vermiculite mine and Rainy Creek Road.
- OU4. A "site-wide" operable unit which includes investigations and remedial actions conducted anywhere at the Site not specifically limited to a separate OU - primarily RI/FS activities and remedial actions conducted at residential, commercial, and public properties in the Libby area.
- OU5. The former Stimson Lumber Mill, defined geographically by the property boundary of the parcel.
- OU6. The rail yard owned and operated by the Burlington Northern and Santa Fe Railroad (BNSF), defined geographically by the property boundaries of BNSF and extent of contamination associated with the rail yard.
- OU7. The area of Troy, Montana, including all actions specifically addressing Troy.
- OU00. A second "site-wide" OU which includes remedial assessment and removal actions conducted anywhere at the Site not specifically directed toward one of the other OUs described above. This primarily includes removal assessment and removal actions conducted at residential, commercial, and public properties in the Libby area.

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## 1.5 Purpose and Scope of this Document

This document is a human health baseline risk assessment that is focused specifically on OU4 (currently developed residential, commercial, and public properties in the general area of Libby). The "Libby study area boundary" for OU4 was established in 2002, and encompasses most of the populated, developed areas in and around Libby where vermiculite wastes and products may have been used frequently and most locations in Libby where vermiculite workers resided (i.e., does not include Troy). The current OU4 study area is shown in Figure 1-x. This area includes a total of approximately 4,000 developed properties. Although the Study Area for OU4 is not expected to change significantly, the boundaries may be revised as additional data on levels and patterns of mine-related contamination are obtained.

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## 4.0 PATHWAYS OF HUMAN EXPOSURE IN OU4

### 4.1 Site Conceptual Model

The first step in developing a risk assessment at a site or an Operable Unit is usually the development of a site conceptual model (SCM). The purpose of a SCM is to organize and focus thinking on likely sources of contaminant release to the environment, likely pathways by which contaminants may be migrating in the environment, and likely pathways by which humans might come into contact with contaminants in the environment (USEPA 1989). The site model helps guide sampling and analysis efforts, which in turn may lead to revisions or updates of the site conceptual model as more data become available.

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As discussed previously (see Section 1.5), this risk assessment focuses on exposure pathways that apply to residents and workers who reside, work, or attend school in or about the community of Libby (OU 4). Figure 4-1 presents a conceptual model for human exposure to asbestos at the Libby site that has been developed based on our current understanding of sources and likely pathways of transport or migration and potential human exposure in OU4. Because inhalation of asbestos particles in air is the primary exposure pathway of concern, only inhalation pathways are included in this SCM. Exposure by ingestion of contaminated soil, sediment, dust, or water might also be occurring at the Libby site, but this is currently believed to be a very minor source of risk compared to the inhalation pathways.

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Other exposure pathways that may also be of concern at the Site will be evaluated during on-going investigations and evaluations for the other OUs at the Site. For example, it is anticipated that the evaluation for OU3 (the mine) will include an assessment of exposures of workers and recreational visitors in forests and other public areas near the mine, and will also include assessment of exposures associated with releases along highway and railroad transportation corridors (e.g., Rainy Creek Road, Highway 37, etc.). Likewise, mine-related exposures that occur in and about the community of Troy will be evaluated as part of OU7.

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### 4.1.1 Sources of LA Asbestos

Ultimately, all pathways of exposure to LA in and about the community of Libby may be traced back to the mine and the mining, milling, and production operations associated with the mine. The most important pathways by which historic mining, milling, and processing operations caused releases of LA into the environment are believed to include the following.

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1. *Airborne Releases.* When the mine, mill, and processing facilities were operating, activities at these locations released asbestos fibers into the air (add references..). These airborne fibers would have been carried by the wind in a down-wind direction. Most fibers likely would fall to earth and lead to contamination of surface soils, while some fibers may have been trapped in tree bark or deposited on surfaces of buildings, streets, etc. Although the mine and processing facilities are no longer operating, airborne release of fibers from exposed asbestos-contaminated soils, exposed ores, or other contaminated outdoor surfaces is likely still occurring, albeit at a lower rate than in the past.

2. *Solid Waste Releases.* Solid wastes generated at the former mine site or at milling and processing sites (the screening plant and the two export plants) may also be a source of past and/or current releases to the environment. In some cases, solid waste material was used as fill or soil amendments in residential yards, gardens, and driveways. Solid waste materials were also used around public facilities, such as schools and ball fields, resulting in direct exposures through recreational activities.

3. *Use of Vermiculite Product.* Product from the mine (unexpanded or expanded vermiculite) was used as insulation in a number of homes, schools [??] and businesses in Libby. Because Libby vermiculite contains LA as a contaminant, the vermiculite insulation, if it exists in an unenclosed space, can serve as a continuing source of exposure to residents or workers who may come into contact with the vermiculite. Vermiculite insulation that is fully enclosed (e.g., within a wall) is not likely to be a current source of exposure, but could become a source of exposure if the containment is damaged or breached.

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### 4.1.2 Transport Pathways

Because asbestos is a solid, once it is released into the environment, it will generally tend to stay in place. However, there are three main ways by which migration may occur:

1. *Airborne Transport.* Because asbestos fibers are small, they may become suspended in air, and once in the air, they will tend to move with the air. The time that the fibers remain in air (and hence the distance they may move before returning to earth) depends on the size of the particle and how turbulent the air flow is, and may range from only a few minutes to a number of hours (add reference).

2. *Surface Water Transport*. Although asbestos is not soluble in water, suspended particles may be carried in surface water runoff (e.g., from rain or snowmelt) from the mine or other areas where soil is contaminated by asbestos, and deposited in soils or sediments at downstream locations. Fibers may then be released to the air from contaminated soils or dried sediments by either wind or mechanical disturbances.

3. *Bulk Transport*. Solid wastes that contain vermiculite or asbestos can be hauled from one place to another by humans for use in a variety of applications (e.g., fill or amendments in yards or gardens). In contrast to airborne and surface water transport pathways, whose impacts can often be reasonably well understood and predicted, the bulk transport pathway can result in the occurrence of asbestos contamination in nearly any location. In addition, contaminated soil and other similar material may be transported inadvertently by adherence to shoes or clothing, and can lead to contamination of dusts in homes, workplaces, schools, and vehicles.

### 4.1.3 Exposure Scenarios Evaluated in OU4

Based on our current understanding of the past and present sources of release and transport of LA from the mine, the media and pathways that are believed to be the most likely to serve as important sources of human exposure in and about the community of Libby (OU4) include the following:

1. *Breathing Ambient Outdoor Air*. Although general ambient air may be impacted by any activity that causes LA to be released from a source, it is considered likely that main source of LA in general ambient outdoor air in the vicinity of Libby is release from contaminated soil in and about the community. This is because contaminated soil occurs in multiple locations in Libby, and also because soils serve as a continuous source. Releases of LA from soil into ambient air may be due either to wind blowing over the soil, or from a variety of disturbances of the soil by human activity. Other sources that may impact ambient air include contaminated soil and waste at the mine site itself, and possibly the burning of wood that has LA in the bark.

2. *Breathing Indoor Air.* Indoor air exposures to LA may be divided into two main categories: 1) those that occur on a regular basis in the main living spaces of the home, workplace, or school, and 2) those that occur intermittently when someone enters into a non-living space such as an unfinished attic with unenclosed vermiculite.

   The *main living space* of a home, business, or school may become contaminated from two main sources: leaking vermiculite insulation (if present) from walls or attics, and transport of contaminated outdoor soil into indoor dust *via* shoes, clothing, pets, etc. Once in indoor dust, LA may become suspended in indoor air

by disturbance of the indoor dust by mechanical forces (air flow from heating or cooling systems) and a variety of normal human indoor activities (walking, playing, cleaning, etc.).

In an *unfinished attic space* that contains unenclosed vermiculite insulation, nearly any activity that disturbs the insulation is likely to cause a release of vermiculite and LA fibers into the air of the attic. This pathway is likely to occur intermittently for residents who visit an unfinished attic space to place or retrieve stored items, but may be fairly common for a tradesman who must enter such spaces to perform repairs on plumbing, wiring, etc.

A special case, although not truly an indoor exposure, is breathing air inside a vehicle (car, truck) that has been contaminated with LA by tracking in LA-contaminated soil or dust from other locations.

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3. *Breathing Outdoor Air Near a Soil Disturbance.* When a person engages in an activity that disturbs LA-contaminated soil, dust, or mine waste material, LA will be released into the air, with the highest levels occurring in the immediate proximity of the disturbance. Thus, the person causing the disturbance will usually have the highest exposure. This type of scenario may occur at a variety of residential, commercial, school, or recreational locations, and may include a very wide range of behaviors that disturb the soil, dust, or mine waste material. A few selected examples include:

   - A child playing in dirt in his/her yard
   - An adult performing home yard or garden care activities
   - Children or adults engaging in sports or exercise at schools or other public recreational facilities
   - A tradesman installing or repairing buried utility lines
   - A tradesman working on a roof that contains LA deposited from air fallout

Note that some (perhaps most) individuals in Libby may be exposed by more than one of these pathways. For example, a resident may be exposed while working in his/her yard, while indoors at his/her home, and while visiting public areas. For this reason, exposure and risk evaluations must consider the combined, or cumulative, effect of all exposure scenarios and pathways that apply to individuals in the community.

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